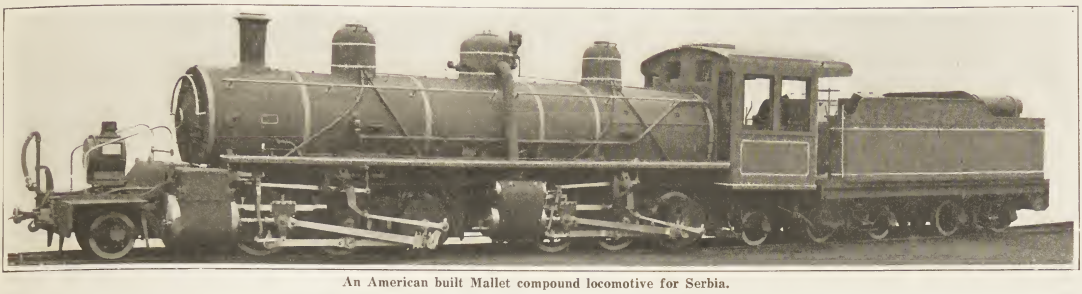

An American built Mallet compound locomotive for Serbia.

runs from the bottom of the frames to the bottom of the side tanks, and five swinging doors on each side allow access to the moving parts. These engines are also arranged for operation from either end. The throttle and reverse lever handles are fitted with a steel link which holds the latch levers in an open position when engine is being operated from the opposite end.

The gage of track is 39⅜ inches, and the engines have a total weight of 58,900 pounds in running order, with cylinders 11½ inches in diameter and 16 inches in stroke, and driving wheels 34 inches in diameter. The steam pressure is 180 pounds, and they have a tractive power of 9,520 pounds.

The boiler is of the Belpaire type, 42 inches in diameter at the front end, and is designed to burn coal briquettes. It is fitted with 144 tubes, 1½ inches in diameter and 6 feet 4 inches long. The firebox is 42 inches long and 2s⅛ inches wide, and is designed so as to drop between the frames for repairs. Ten engines have steel tubes and steel fireboxes, and the other ten have brass tubes, copper fireboxes and copper stay-bolts. A hand-operated automobile horn is installed on each end.

The boiler has a heating surface for both tubes and flues of 354 square feet, the heating surface firebox being 30 square feet, so that the total heating surface is 393 square feet, with a grate area of 3.2 square feet.

Currency in China

THE trade of China is hampered by one of the most confused and chaotic systems of currency, on a silver basis, in the world, the intricacies of which are understood by comparatively few people. Theoretically the tael is the unit of currency for foreign and Chinese commerce, and is subdivided decimally into mace, candareens, and cash (1 tael = 10 mace, 1 mace = 10 candareens, 1 candareen = 10 cash). It, however, is not a coin, but a weight of silver of a certain degree of fineness, and it varies in weight, in touch, and in value in different parts of the country. Every commercial center in China not only has its own tael weight, but several standards side by side. The tael of weight is the liang, or ounce, of China, and 16 taels make 1 catty, or Chinese pound (1⅓ pounds avoirdupois).

THE VARIOUS TAELS IN CIRCULATION.

Of the numerous taels of currency, two may be considered as being in universal use, the haikwan, or "customs," tael and the kuping, or "treasury," tael; a third, the tsaoping, or "tribute," tael, is current over a considerable part of the country. The haikwan tael is the currency in which tariff duties imposed by the Maritime Customs are levied, but it is a purely fictitious currency and at no port does a merchant tender haikwan taels in payment of duties; instead he pays in local currency at a rate of exchange settled upon at the opening of each of the several customs offices. At Shanghai the rate of conversion is fixed at 100 haikwan taels = 111.40 Shanghai taels. The Shanghai tael contains 524.93 grains of pure silver, which makes the haikwan tael the equivalent of 584 grains. Due allowance, however, must be made for the quality, or "touch," of the silver. When the merchant does not have at hand the fine silver (992.3 fine) for the payment of duties, he must obtain it from a banker by private arrangement. The value of the haikwan tael in foreign currency is fixed monthly by the Maritime Customs authorities. In 1914 the average value in American currency was $0.67.

The kuping tael is the currency in which all dues to the Government except customs duties and those which are levied in kind or copper cash are paid. The standard kuping tael is 575.8 grains of silver, 1,000 fine, but there is a variation in some cases as much as 1 per cent in different parts of the country. Where the foreign obligations of the Chinese Government are concerned, the equivalent of the several currencies is 100 haikwan taels = 101.64235 kuping taels, and 100 kuping taels = 109.60 Shanghai taels.

The tsaoping tael is current in Provinces which pay tribute in kind (mainly rice), and it is also in use at Chefoo. Subject to slight variation, it weighs 565.65 grains. As a tael of currency, it is based on different standards of silver. The staudard at Chefoo is 976, at Kiukiang and Wuhu 994, at Hangchow 997, and at Shanghai 999.

Apart from the various Goverumeut taels, every commercial place has several local taels, all generally recognized and all current. Usually among these various taels there is one which is recognized as the currency of the place, in which payments would be made when there is no stipulation to the contrary. In Peking there is no one recognized tael, but the Tientsin tael of 557.6 grains of silver, 992 fine, is the generally accepted tael at Tientsin; the Hankow tael of 554.7 grains of silver, 967 fine, at Hankow; and the Sze-ma, or Canton tael, of 579.85 grains of silver (theoretically 1,000 fine, but in practice of a lower degree of fineness), at Canton.

At Shanghai the Canton tael is used for dealings in foreign bar silver, the tsaoping tael for Chinese remittances through Chinese banks to places in China, and the Shanghai tael, or "Shanghai convention currency," for local banking and trading purposes. The value of the latter is made up of three elements—the weight, the quality of silver, and a convention. The weight on the scale is 524.93 grains, the silver is reduced to a standard of 944 fine, and the convention is that 98 taels of this weight and this silver settle a liability of 100 taels Shanghai convention currency. At the present time (June, 1915) the value of the Shanghai tael in United States currency is $0.55.

SILVER SHOES (SYCEE) AND COPPER CASH.

The silver in China is most commonly current in oval ingots called "shoes," which weigh from 5 to 50 taels, and the silver in the shoe is known as "sycee." In the interior of the country, outside the treaty ports and among the mass of the population, silver is not extensively circulated and is used mainly for the purpose of hoarding. Frequently the Chinese who secure silver coins melt them up into sycee. But when very large payments are made, the shoes of sycee are employed and they are accepted at their actual weight and degree of fineness.

The real currency of the people of China is the copper cash, one of which equals one one thousandth part of a tael. This is its theoretical value, but in practice the value varies from 800 to 1,800 or 2,000 cash to the tael, and it is not uniform throughout the country. Cash (from the Sanskrit "kârsha") are small round coins with a square hole in the center and they are strung on strings in rolls of 100, of which 10 go to the string, or "tiao." The money changers usually deduct 1 to 4 cash for their trouble in stringing and for the string. In Shanghai at the present time the Shanghai tael is worth 1,925 cash, whereas a year ago it was worth only a little over 1,700 cash. The depreciation in the value of the cash has a very serious effect on the mass of the people and considerably restricts their purchasing power. A piece of gray sheeting, for example, may be quoted in an interior city at 4 taels. The native, at the present rate of exchange, would have to pay 7,700 cash for the piece as compared with only 6,800 cash a year ago. In addition to the 1-cash piece there are 10-cash copper coins, or cents, which, however, are not always exchanged at their face value.

FOREIGN COINS—CHINESE DOLLARS—CURRENCY REFORM.

The growth of foreign trade and the objection of the foreigners and merchants in the treaty ports to carrying around the heavy silver sycee, or shoes, and cash, led to the introduction into China of a number of foreign coins of which the principal ones were the Carolus, or Spanish, dollar; the Mexican, or eagle, dollar; and the Japanese yen, or dollar. Of these the Mexican dollar is in most general use and it is current in many of the treaty ports of China. Its exchange value is expressed in relation to the tael. At the present time the rate of exchange is 100 Mexican dollars = 72.80 Shanghai taels. Taking the Shanghai tael at $0.55 United States currency, this makes the value of the Mexican dollar about $0.40.

The Chinese have also issued 10 or more different kinds of dollars, but their great disadvantage has been that they are at a discount in all the Provinces except the one in which they are minted. There are also in circulation a number of subsidiary silver coins known as 10-cent and 20-cent pieces, which are nominally fractional parts of a dollar but are stamped with a tael value, the 10-cent piece, for instance, being stamped as 7.2 candareens. The ratio which these coins bear to the dollar varies considerably. At times ten 10-cent pieces and four 10-cash pieces, or 114 cents, may be obtained from a money changer for a Mexican or Chinese dollar, while at other times only ten 10-cent pieces are given in exchange. In recent years the provincial mints in China have been permitted to issue silver and copper subsidiary coinage for purposes of revenue, and this has led to an enormous overissue and consequent depreciation in the value of these coins.

In January, 1914, a new regulation went into effect by which it is hoped that some measure of reform in the currency of China may be effected. Under this regulation the right of minting and issuance of national currency is confined to the central Government. Provision is made for four kinds of silver coins, the yuan or dollar, the ½-yuan, 20-cent pieces, and 10-ceut pieces; one kind of nickel coin, the 5-cent piece; aud five kinds of copper coins, the 2-cent piece, the 1-cent piece, and one half, one quarter, and one sixth of a cent pieces. In order to facilitate the carryiug out of the provisions of the act, the Goverumeut is melting up all the dollars formerly in circulation that are received iu payment of taxes and replacing them with the new standard dollars, which are made legal teuder throughout the country. Every effort is being made, through the large Chinese banks and governmental support, to give to the new coins a fixed and uniform value in all parts of China, and it is expected that they will gradually replace the numerous kinds of money now in circulation that add to the confused and chaotic state of the country's currency.

PAPER MONEY IN CIRCULATION.

Paper money has been issued from time to time by the central or provincial governments and by private individuals and banks. Formerly there was little restriction on the amount that could be issued, and the large quantity of notes in circulation that in financial crises the banks frequently could not redeem has caused them to depreciate iu value or to become practically worthless. At present, notes are issued by the foreign and Chiuese banks only in the local currency of the places in which they are situated, the issues being restricted by their owu regulations. These notes, which are in dollars, are redeemed by the banks at their face value; but a note for, say, 5 dollars issued by a bank at Shanghai is slightly discounted by the branch of the bank at Tientsin, Hankow, or any other city when presented for redemption.—*From Special Agents Series, No. 107, of U. S. Department of Commerce, "Cotton in China."*

Unnoticed Pollution of the Air

IN an investigation of air pollution Mr. William Thomson, F.R.S. (Edin.) devised an instrumeut for detecting the very fine and invisible solids that pervade the atmosphere in every city. The air is drawn by suction through a hole ½ millimeter by ¼ millimeter in an otherwise airtight, stationary brass drum, the drum being connected with a vacuum pump. The air thus filtered leaves on the surface of a ribbon of filter paper over the hole the impalpable smoke and dust contained in it, the ribbon being drawn forward half an inch each half hour to obtain a new impression. This pollution is of so impalpable a character that it permeates all rooms in the city, and does not, of course, include smuts or heavier dust and fine ash which are constantly being discharged from factory chimneys.

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A workman in the U. S. Assay Office, in New York, shoveling foreign gold coin into the melting furnace.

MELTING DOWN FOREIGN GOLD.—[See page 248.]

Casting molten gold into ingots in iron molds.

Weighing ingots of gold at the U. S. Assay Office.

Melting Down Foreign Gold

What Becomes of the River of Coin Flowing From Europe

When the great war began the allied countries found themselves not only inadequately provided with the materials which had heretofore been considered necessary for the conduct of a military campaign, but they were also practically destitute of the hundreds of things that the new methods of warfare since developed have made indispensable. They were short of arms of every description, from the pistol and bayonet to the great siege guns that were so sensationally disclosed by the Central Powers, together with ammunition for the same. They needed clothing and food in immense quantities, motor vehicles of every description for the transportation of men and materials, locomotives, aeroplanes, motors, balloon material, barbed wire and thousands of other articles, and these so quickly that their own resources were able to meet but a fraction of the demand; and naturally they turned to the vast resources of America for assistance.

It is not alone for materials for the armies that the resources of America have been requisitioned, but supplies of every description have been needed for home consumption, as the diversion of every available manufacturing establishment to the making of munitions, and the lack of men to cultivate the fields has resulted in a shortage of almost everything in all the countries engaged in the strife, so that a double demand has been thrown upon the United States that is steadily draining it of material that is actually needed at home.

In payment for this vast mass of material gold, largely in the form of the coin of the various purchasing nations, has been flowing into this country in vast amounts for more than a year, and the tide is still on the flood. Not only have these payments come from Europe, but gold has poured across the border from Canada so fast in recent weeks that a recent shipment of $20,000,000 had to be divided between the New York Assay office and the Philadelphia Mint in order to give employes of the former institution a chance to get caught up with their work.

While records are not complete to the final dollar's worth of gold imported so far this year, in round numbers the total has been around $500,000,000, and of this amount $294,000,000 has been entered since May 10 either at the New York Assay office or at the Philadelphia Mint for the account of various banking houses.

So far it has not been found necessary or expedient to make shipments to the Denver Mint, as was suggested when the unusual quantity of gold began to arrive. The Assay office in New York was prepared from the middle of July on to receive approximately $3,000,000 a day on the average of the bars and coin exported by Canada and England, though the shipments were not expected to be regular. There have been many scattered receipts of amounts ranging from $10,000,000 to $25,000,000, but the bulk of the importation has been divided into shipments of $2,500,000 up to $5,000,000.

No less important from the banker's point of view than the extraordinary total imported is the prospect that the inflow will continue for an indefinite period. The influence of this gold on the credit facilities in this country cannot be estimated.

Comparisons with the amounts received in previous years is most interesting. The gain in gold reserve since the beginning of 1914 has been nearly two-thirds as large as the entire per capita resources in 1896.

So great has the amount of foreign coin been that it has been impossible to utilize all of it in its original form, and consequently a very large proportion of this coin has been sent to the mints of the United States to be melted down into bars and ingots, which later can be re-coined into United States money, or made use of in these forms for future transactions. Most of this work of melting down the foreign gold has been done at the U. S. Assay Office in New York, and the accompanying illustrations show some of the operations. In the cover illustration a workman is shown in the act of shoveling gold coin into a melting furnace, and it is startling to see such wealth being handled with an ordinary coal scoop. Another picture showing the weighing of gold bullion on a scale of great size, but necessarily of extreme accuracy, gives a striking impression of the difference in mass between the brass weights and the bars of fine metal.

Some Curious Electrical Experiments

X-ray Investigation.—Take an ordinary electric light bulb, coat it with aniline violet collodine. Take an ordinary piece of glass; coat same with a little sulphate of quinine dissolved in gum-water. Expose a plate for X-ray photograph in ordinary way to the light of violet lamp passing through the quinine sulphate screen. X-ray effect clearly observed.

Take same violet lamp, place in a small mount, and attach to the eyepiece of any telescope. Put the lamp in series with a dry cell (sufficient to send a current through lamp, but not to incandescence). Insert in the circuit a telephone receiver, in front of which is a microphone augmenter in circuit with a second telephone. By winding round the ebonite case of the first receiver telephone 50 to 100 turns of No. 30 wire in series with an independent battery and adjustable resistance, a stellar bolometer for measuring radiant heat is obtained far superior to the ordinary Lawley bolometer. The arrangement can also be used as a very delicate thermograph for measuring low temperature; even liquid air and hydrogen providing compensating resistance is sufficient.

Take the same lamp (violet), place in series with battery (to light), and an ordinary electric bell contact-breaker; place lamp by the side of any potted plant, so that light-wave can pass (actinic wave, that is), through flower-pot to roots of plant, stimulated growth is obtained.

Take same lamp in series with lighting battery and sound-augmenter microphone, which should be carried into a distant room where music is being played. Place the lamp in a dark room, and sit beside it while the music is being played, and note the effect of the violet-light vibration (from music) on the weary brain. Beats all spirit hanky-panky business—a genuine cerebral phenomenon that requires no half-guinea medium to produce.

Take same violet lamp and screen battery (sufficient for current only) in series with telephone receiver. Attach a microphone sound augmenter in series with second telephone and battery. Place the violet lamp and screen on any dead body—plenty of cats about—but do not use the landlady's pet Tommy, or look out for the S. P. C. A. A faint humming in the second 'phone will be produced as long as any organic life is present in the corpse. It does not cease until days after the normal physical life is dead—in fact, the aroma of the corpse will stop experiment long before the telephone thinks of going on strike.

Take the same lamp and screen (lamp current not sufficient to light); connect series to battery and telephone sound augmenter and second telephone. Place lamp where you please. If any person or object crosses the path of the lamp—providing any ray of light touches the moving body or person—the distant 'phone will "hum"—in fact, there are times when the "hum" will be produced from a dark room without a stray ray of light in same. Now we shall have the spirits moving to tell us the reason why. Well, never mind the spirits; but what price a good burglar-detector? Once Bill Sykes crosses the path of the lamp, and the faint light of his lantern or electric torch kindly rings the bell for P.C. A7 round the corner to make a friendly call. It ought to be superior to that door contact he has just put out of action!—*C. Mayfield, in English Mechanic.*

A Cheap Disinfecting Fluid

A most useful work that is being performed by municipal and government electric plants in various parts of the world is the preparation of a disinfecting fluid, quantities of which are required in every city and town. This fluid as usually produced is prepared by the electrolysis of a saturated solution of chloride of magnesium together with certain proportions of common salt and caustic soda. In some cases, at stations situated on the sea coast, sea water is converted directly without the addition of any other material, and the only expense is for the electric current. The disinfectant produced as above described costs but a trifle, so that any town possessing apparatus for the purpose can afford to use the liquid quite freely.